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JANUARY 25th 1958

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Prolonged Gestation in an Ayrshire Herd

BY

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SUMMARY.—Nine cases of prolonged gestation (348 to 381 days) are recorded from an Ayrshire herd. The calves were all offspring of one bull. Significantly more of them were produced by the daughters of one bull than by those of another bull. These two facts suggest that the genotypes of affected calves are at least a contributory if not a sufficient cause of the condition.

Clinically, the outbreak had different features from those described in recent reports. The birth weight of the calves was greater than normal for Ayrshires, but considerably less than would be expected if the abnormal calves had grown normally during their hypermature period.

Prolonged gestation calves suggest that foetal weight is not an overriding factor in precipitating parturition.

ISOLATED and sporadic cases of prolonged gestation associated with continued growth of the foetus are well-known in cattle (Andres, 1931). The present note describes the occurrence of 9 cases in 2 years in a pedigree commercial herd of about 40 cows.

Clinical Observations

Details of the length of gestation, the sex of the calves, and their birth weights when known are shown in Table I.

The gestations recorded in Table I vary from just under 2 months to just over 3 months above average. They are, therefore, considerably outside the normal range of gestation length.

The calves are also heavier than normal for Ayrshires. For comparison, Ayrshire birth weights on one A.B.R.O. farm had a mean of approximately 80 ± 13 lb. Four out of the 5 affected calves weighed at birth were over 95 lb.

TABLE I

DETAILS OF PROLONGED GESTATIONS

Duration of Pregnancy (days)	Days over 280 days	Birth Weight (lb.)	Sex of calf
336	56	—	♂
348	68	97	♂
352	72	80	♀
354	74	—	♀
356	76	—	♀
363	83	98	♂
372	92	111	♂
379	99	—	♀
381	101	120	♀

Five of the calves were male and the other 4 female.

Five of the 9 calves were dead at birth, although, judging by their appearance, they were probably living at the beginning of parturition. The remaining 4 were born alive. Two were destroyed by the farmer at birth. Two lived for 2 days and were then destroyed. No opportunity occurred to see whether the calves could be reared.

Fig. 1 shows a photograph of a large affected calf and a calf stillborn after a normal gestation for comparison.

Clinically the calves have shown the usual features of prolonged gestation in cattle. The hair in several animals was very long and was occasionally found

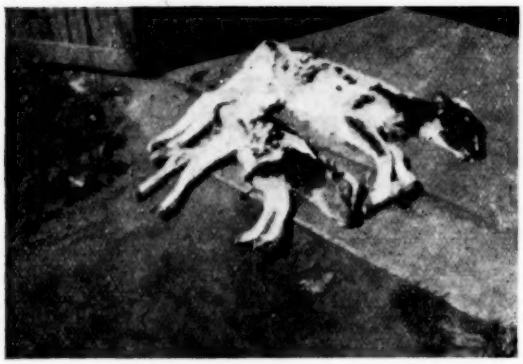

FIG. 1.—Calves born after (A) normal and (B) prolonged gestation

in large amounts in the afterbirth. Hooves and teeth were also well developed and indeed larger than normal.

Peri-orbital and submandibular dropsy was present in 2 of the animals. In addition, one of the animals which survived for 2 days exhibited tremors and had difficulty in standing due to knuckling over of the hind fetlocks.

Post-mortem examination of several calves revealed no gross anatomical abnormalities.

Most of the cows concerned apparently showed few signs of parturition at the expected time of calving. There was no obvious relaxation of the pelvic ligaments. In several cases, however, according to the owner, the udders filled although no lactation ensued. This symptom disappeared as the pregnancy was prolonged.

At the time of calving, normal symptoms were observed. Both relaxation of the ligaments and filling of the udder occurred 2 to 3 days prior to parturition.

Assistance was usually necessary. One calf necessitated embryotomy and considerable traction was used on two others. In one case the presentation was breech. One of the dams died and most had retained membranes. In 8 cows there was post-parturient lameness of the left hind leg, the affected cows walking with a stringhalt-like action. The lameness, however, passed off in a few days.

The owner stated that the affected cows generally had reduced milk yields although the cow with the severest dystokia gave more than 900 gallons. The stress of calving has not induced sterility in the cows since 6 of them have again calved once and two twice, all with normal pregnancies.

Breeding History

Before the appearance of these calves several bulls had been used on the herd with no similar cases. Daughters of 2 of the bulls (B and C) constituted the main part of the herd.

The 9 calves were all offspring of one bull (A). The majority followed matings to the daughters of bull B

In the middle of bull A's period of service, he was ill for 6 weeks and was not working. Artificial insemination bulls were then used on 14 cows and none of their pregnancies were prolonged.

After bull A was withdrawn, A.I. bulls were again used freely. No long gestations occurred although the bulls were mated to approximately 36 daughters of bull B.

Fifteen of bull A's normal daughters have been bred to A.I. bulls without abnormality.

The 8 surviving cows which had prolonged gestations have since produced 10 normal calves in matings to bulls other than bull A.

The gestation length of 40 normal offspring of bull A was 282 days.

Genetics

Table II shows the total number of normal and affected offspring of bull A classified according to their maternal grandsire.

Fifteen of B's daughters produced the 17 normal animals. Twenty-three of C's daughters produced the 28 normal animals. One of B's daughters produced both a normal and an affected calf to A. Otherwise the number of offspring corresponded to the number of mothers.

Two other points may be noticed. Two of B's daughters which produced affected calves were full sisters. Secondly, several of the mothers of affected calves had had normal offspring from previous matings.

TABLE II

OFFSPRING OF BULL A

Maternal grandsire	B	C	Other bulls
Number normal offspring	17	28	10
Number affected offspring	7	1	1
Total offspring	24	29	11

It can be seen from Table II that there is a much higher proportion of abnormal pregnancies after matings of bull A to the daughters of bull B than to those of bull C. This difference is significant at the 5 per cent. level. It would appear, therefore, that prolonged pregnancies occur more commonly after certain types of matings than after others.

If the defect were due to an autosomal gene, and if both bulls A and B were carriers, only 3 affected calves would be expected in the 24 offspring of bull A when he was mated to the daughters of bull B. Seven occurred. This would only be expected about once in a hundred times. In view of the small numbers involved, however, the possibility of a recessive gene cannot be excluded.

Bulls A and B were related about 4 generations back in their pedigrees.

A possible explanation is that bull B is a carrier and bull A a homozygote who survived at birth and was reared. When A was mated to B's daughters,

approximately 6 out of the 24 offspring produced would be affected. Seven were produced. It is unlikely, however, that a breeder would retain a bull calf from such an abnormal happening as a prolonged gestation.

The disease is not due to a simple dominant since only 9 offspring out of 64 produced by bull A were affected instead of the expected 32.

The most likely alternative to a recessive gene is that the form of inheritance is complicated, and that while both sire and dams are involved, simple Mendelian ratios are not obtained.

On present data, it is impossible to determine whether the maternal effect is due to the mother's genetic contribution to the calf or to the maternal environment she provides for it. It is impossible to say, therefore, whether the condition is due solely to the calf or whether both the calf and the mother are physiologically abnormal.

Cases of prolonged gestation have been attributed to environmental causes. Alvarez (1947) reported cases in vitamin A deficient cattle. There was, however, no sign of this in the present herd and assay of the vitamin A in the livers of 2 of the affected calves showed normal amounts present. The herd management was excellent.

Comparative Aspects

Three other outbreaks of prolonged gestation have recently been reported in cattle. Gregory *et al.* (1951) recorded 30 cases over a period of 5 years in one herd of American Holsteins. Hallgren (1951) recorded 11 cases in 4 years in the Swedish Red and White breed in a small section of a veterinary practice. Kennedy *et al.* (1957) recorded 6 cases in a Guernsey herd in 8 years and 4 cases from 3 other Guernsey herds.

Table III shows comparative data from the different reports.

TABLE III

PROLONGED GESTATION IN THE FRIESIAN, AYRSHIRE SWEDISH RED AND WHITE AND GUERNSEY BREEDS

	Average days overdue	Range	Average birth weight lb.	Breed average birth weight lb.	Average breed weight at hypermaturity lb.
Friesians	51 (21)	20– 88	151 (10)	96± 12	164
Friesians (embryotomies)	23 (7)	12– 40	109 (7)	96 ± 12	109
Ayrshires	80 (9)	56–101	101 (5)	80 ± 13	185
Swedish Red and White	125 (8)	52–230	98 (5)	—	—
Guernseys	121 (9)	12–246	40–70	72(♀ only)	

The figures in brackets refer to the number of animals.

The Friesian average weights were obtained from Matthews and Fohrman (1954), the Guernsey average from Davis and Hathaway (1956), and the Ayrshire breed average from an A.B.R.O. farm. The last column in the table gives the average weight of normal calves at the same age from conception as the prolonged gestation calves at birth.

These figures must be treated with caution. The numbers for the Swedish Guernsey, and Ayrshire breeds are small. The birth weights recorded for the Swedish prolonged gestation calves were mainly obtained on slaughter of the cow prior to any attempt at natural calving. The breed-average birth weights shown were obtained from herds different from those in which the prolonged gestations occurred. None the less, the figures indicate that there are dissimilarities in the reports. The Friesians had the shortest gestations, the Ayrshires were intermediate, and the Swedish Red and Whites and Guernseys were longest.

Differences in calf weight can also be seen. The Ayrshire prolonged gestation calves are heavier at birth than normal animals at birth, but they are much lighter than average Ayrshire calves of the same age since conception would be. The situation appears to be somewhat similar in the Swedish calves where the average birth weight of the long-gestated calves was relatively low. In the Guernseys it was even lower than the normal birth weight. In the Friesians, however, the prolonged gestation calves were approximately normal in weight 23 days after the normal gestation length (as shown by the weights at embryotomy) and also relatively to normal growth when they were born.

Several explanations of this slow growth in the Ayrshire, Guernsey, and Swedish Red and White breeds are possible. The mother may control the size of the foetus by hormonal methods. The placenta may be too small to nourish the foetus. Possibly the calves are genetically-produced dwarfs. It may be noted that since no embryotomies were performed in these breeds, it is not known whether the slow growth was occurring before 280 days or not.

The calves have also differed clinically from breed to breed. In the Swedish cases, acromegaly, hydrocephaly, jaw anomalies, and hairlessness were present. In the Guernseys, the calves had disproportionately short limbs and exhibited varying degrees of hypotrichosis. Adenohypophyseal aplasia was a constant feature. Rasbech (1950) recorded a few cases exhibiting achondroplasia. In the Ayrshires and the Friesians, the calves were anatomically relatively normal. In the Friesians, however, a characteristic feature was that all the surviving calves died within a few hours of birth (Jasper, 1950). Two of the British calves survived for 2 days.

It is clear that gestation lengths, foetal sizes, and clinical histories differ considerably. Inheritance, however, has been implicated in all reports. In the Friesians, Gregory *et al.* (1951) suggested that both the sire and dam were responsible. They considered the condition to be due to an autosomal recessive gene. There were, however, more females than males among the defective calves. A recessive gene was also postulated by Kennedy *et al.* (1957). In the Swedish cases, several bulls produced the defectives but these were related to each other and probably also to the cows.

Gene Action and Parturition

The chief interest of the defect lies in any light it may throw on the cause of parturition. Whatever the normal cause or causes of parturition, they fail or are overridden in these cases for at least some time.

The rôles of the mother and the foetus in precipitating parturition are as yet undecided. Recent work emphasises, however, that the foetus plays a rôle; for example Rollins *et al.* (1956) summarised evidence based on paternal, half-sib correlations indicating that the heritability of gestation length regarded as a character of a calf is about 30 to 50 per cent. The genotype of the calf therefore influences the length of time it is carried. Prolonged gestation calves emphasise this point.

The physiological mechanism precipitating parturition remains a mystery (Wright, 1952). Reynolds (1949), however, suggests that several factors are involved. These include (a) withdrawal of inhibitory factors such as the corpus luteum elaborating progesterone and the placenta acting either directly or indirectly on the uterus, and (b) the presence of stimulatory factors such as oestrogens, derived either from the ovary or placenta, and the distension of the uterus by the products of conception. Gene actions could be postulated interfering with any of these mechanisms.

Without detailed physiological examination, the principle factor on which prolonged gestation seems to throw light is foetal weight. This is frequently given considerable emphasis as a factor precipitating parturition. Prolonged gestation cases suggest it is not an overriding one.

Prolonged Gestation in Other Species

Cases of prolonged gestation (up to 7 weeks overdue) are well known in man (McKeown & Gibson, 1952). Little is known, however, of either the aetiology or physiology of the condition.

Experimental prolonged gestation associated with foetal gigantism can be induced in mice by various hormonal treatments of the mother (Engfeldt & Hultquist, 1953). The question whether the foetal gigantism is due to the direct effect of the hormones on the foetus or to the prolongation of the duration of pregnancy is still under discussion (Tuchmann-Duplessis & Mercier-Parot, 1956). The experimental situation is different from that occurring in cattle in that in the latter the genotype of the foetus is certainly involved.

Distribution

The defect does not seem to be widely distributed in the breeding areas centred in Ayrshire. Enquiries from local veterinarians and breeders have elicited little response. Two cases have, however, been recorded, both from A.I. bulls. If the condition is due to a recessive gene, the gene frequency in the population is probably very low since A.I. bulls associated with prolonged gestation would almost certainly arouse comment.

Acknowledgments.—We should like to thank Dr. E. C. Owen for carrying out the vitamin A estimations, Messrs. Robert Carruth of Kilbarchan for their co-operation, and Dr. A. G. Dickinson for discussing the problems.

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"FLYING" VETERINARY SURGEON

From a press report we understand that a "flying veterinary service" is in operation in parts of New South Wales, where the veterinary inspector is responsible for about 3,500,000 sheep and 30,000 cattle, spread over an area of some hundreds of miles. Calls close at hand are attended by car, but for more distant calls an aircraft is used in order to reach cases the same day.

The service works in close collaboration with the well-known flying doctor service, whose radio stations pass on messages to the veterinary inspector. An example of this co-operation was given during an outbreak of anthrax in sheep, when the veterinary inspector discovered a case of anthrax in one of the station employees, and flew him to hospital.

VETERINARY FEES IN GERMANY

West German veterinary surgeons are paid more highly for treating rabbits and other animals than are doctors for treating people, according to the German Physicians' Society.

Veterinary surgeons, it is said, are allowed to charge about 5s. for examining a rabbit. Doctors may charge only about 3s. for a similar examination of a human patient.

The fee for an emergency visit to a cow or horse is about £1 3s. A doctor's emergency call costs about 12s.

The Association with some justice, it would appear, is calling for increases in the fees doctors are allowed to charge.

Metabolic Disorders Associated with Movement of Hill Sheep

BY

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A PROBLEM which it is believed is becoming of increasing importance in sheep throughout many parts of Wales is well illustrated by the following incidents.

On Monday, March 18th, a hill farmer in Mid-Wales brought home to lamb 260 hill ewes from certain hill pastures at an elevation of 1,000 to 1,300 feet. Because of the mild winter and spring this movement took place about 3 weeks later than usual. The ewes walked a distance of between 2 and 3 miles and by about 11 a.m. they were safely enclosed in about 8½ acres of a fertile but bare field near the farm buildings. This field was bare as it had carried 200 lowland ewes during the preceding 3 weeks, although it had been rested for most of the winter. It was fertile as the mixen (manure heap) in the farm-yard drained into it. The ewes settled down in the field but on the following morning (Tuesday) at 6.30 a.m. one was seen to be unwell, and by 9.30 a.m. 11 were obviously ill. They were showing nervous symptoms and many were in a state of collapse, although not in a coma. By 6.30 p.m. one ewe had died and 28 were recumbent in various attitudes. A number were on their sides and others on their briskets, some were lying quietly while others made spasmodic attempts to rise. A green discharge of ruminal contents was present in the nostrils of a few. The affected animals, all of which were more than 3 years old, were brought into the shelter of a Dutch barn.

During the night 22 ewes died although no fresh cases developed. During the course of the day fresh cases developed and between 1 and 1.30 p.m. on the Wednesday, 6 ewes of the 16 ewes still affected were bled and all were injected with a mixture of calcium and magnesium; all except one made uneventful recoveries. Analytic results showed that all 6 ewes bled were suffering from hypocalcaemia with values varying from 2.4 to 3.0 mg. per cent. of serum. The magnesium levels were normal, not one was less than 1.8, and 3 were above 2 mg. per cent. The acetone levels were also normal.

The second incident has a number of features in common with the first. The ewes were brought down in two separate batches from hill land at an elevation of 1,200 to 1,300 feet. The first batch comprising 120 animals was transferred from the hill to the lowland pastures on March 15th. The following day 6 ewes were showing nervous symptoms. They were treated with a mixture of calcium and magnesium and recovered: 2 died during the night of March 16th-17th; no fresh cases appeared on the 17th. It is not known if the 2 animals which died were amongst those treated on March 16th. On March 18th, 4 fresh cases were seen. These were given similar treatment and recovered. On the same day the second batch, 126 ewes, was transferred from the hill and added to the first batch on the same pasture. On March 20th, 5 of the ewes were obviously ill and it was not possible to say from which group they came. On this day the farm was visited by one of us when 12 ewes were bled. Six blood samples were taken from the animals which had been transferred from the hill to the lowland pastures; at the time they were selected for bleeding, none was showing symptoms. However, one developed clinical symptoms before this operation was completed. The other 6 samples were taken from ewes of the same breed and type which had spent the winter on the lowland pastures at our request, as this particular flock had a somewhat similar history in the spring of 1956. They also were apparently normal at the time of bleeding. Unfortunately all the clinical cases had been treated with calcium and magnesium by injection prior to our visit, consequently only one blood sample from a clinical case was worthy of analysis. The affected ewes were aged animals, not less than 4 years old.

The results of the examination of the blood samples are set out below.

TABLE I

Identification	Calcium m.g. p.c. serum	Magnesium m.g. p.c. serum	Acetone mg. p.c. serum
L1	6.6	1.6	Normal
L2	7.6	1.6	"
L3	6.6	2.7	"
*L4	3.0	1.5	"
L5	7.9	1.6	"
L6	7.7	2.4	"
R1	8.5	2.0	"
R2	7.3	2.5	"
R3	7.6	2.3	"
R4	9.7	1.6	"
R5	8.0	2.5	"
R6	8.1	2.6	"

* This animal, referred to in the text, developed symptoms while bleeding operations were in progress.

Those samples labelled L1 to L6 were taken from ewes which had spent the summer and winter on the upland pastures until March 15th, the day on which they were moved. It will be seen that the calcium and magnesium blood levels are, on the whole, below the normal; the sample marked with an asterisk from the ewe which developed symptoms is very low in calcium. The samples labelled R1 to R6 were those taken from ewes which were on lowland pastures

during the preceding winter and summer. It will be seen that the calcium levels, although low, are appreciably higher, on the whole, than those of the samples L1 to L6. All of the magnesium levels in this group are normal except that labelled R4.

Discussion

A number of features of these two incidents are of great interest to the authors and it is believed they are of general interest. A history of transfer of hill ewes during the fortnight or so before lambing from poor to good pastures, involving movement from a high to a lower elevation and followed by a metabolic disease, is very common. These metabolic disorders involve changes in the calcium and magnesium levels either separately or together; commonly the depression is in magnesium. The incidence of conditions of this type is higher in a mild spring than when periods of hard weather precede such movements of hill flocks. It is suggested that this is not unrelated to the fact that during a mild spring the flocks can be kept on the upland for a longer period and consequently, when the transfer is made, the difference between the upland and lowland pastures is exaggerated. It will be noted that in the first incident described only the older sheep in the flock were affected, *i.e.* they were between 3 and 4 years of age whilst in the second incident, all the sheep in the flock were aged animals, having been bought as draft ewes. Hypomagnesaemia in cattle is also most common in older cows (Blaxter & McGill, 1956).

The complexity of the whole problem and the attendant difficulties in diagnosis are well shown by a comparison of the two incidents described. Metabolic disorders appeared in the two flocks at almost the same time under similar weather conditions after an abrupt change in diet. The hill pastures were about the same elevation although not in the same mountain ranges. The soils on the hill pastures differed but they were both characteristically free-draining and relatively easily leached. The symptoms shown by the ewes were essentially the same in the two different flocks. In spite of the similar background to the two incidents described it should be noted that in the first flock the ewes were suffering from a pure hypocalcaemia whereas in the second the blood changes involved both calcium and magnesium though neither was excessively low.

In assessing the significance of the differences in the calcium and magnesium blood levels in the two groups in the second incident it should be remembered that the animals labelled L1 to L6 were, with one exception, apparently normal. L5 was just beginning to show clinical symptoms and she provided the lowest levels in this group. If it had been possible to obtain blood samples from a number of clinically affected but untreated animals it is probable that they would have been of the same order so making the differences highly significant. Even as presented the difference between the calcium levels in the two groups just fall short of being statistically significant.

Neither the history nor the clinical signs seen in these metabolic disorders suggest a true deficiency of either calcium or magnesium—the onset of the condition is too sudden. At the same time it is possible that the intake of one or both these elements, during the summer and winter and preceding the onset of disease, was below optimal requirements; the differences in values in the two groups of six in the second flock certainly suggest this. No comparable figures are available in relation to the flock in the first incident described which thus provides no evidence on the intake of either element. It is possible that a sudden change in diet to a low fibre, high nitrogen intake in animals whose calcium and/or magnesium blood levels are below normal precipitates a crisis in a manner as yet unknown.

Somewhat similar blood changes are sometimes seen in a variety of conditions including gorging with cereals and even "gid" (Hughes & Kershaw). The significance of these changes is not fully apparent—it is possible that they form part of a shock syndrome resulting from stress of different kinds. If this be true, animals subjected to low calcium and magnesium intakes may react unfavourably to stresses which would not prove harmful to animals on a diet normal in this respect. Is the change from the high to low elevation, to a high-nitrogen, low-fibre diet in heavily pregnant animals enough of a stress to precipitate the crisis postulated in the previous paragraph?

The symptoms are of little use in making a diagnosis; blood analysis is essential and treatment should include both calcium and magnesium.

As stated earlier this sort of history is becoming more common amongst Welsh flocks and certain suggestions have been made in an effort to prevent losses of this type. One suggestion which has given successful results, as would be expected, is to reduce the abruptness of the change in diet. This can sometimes be achieved by penning the hill ewes to rough pastures at a lower elevation before they are put on the lowland pastures; in other words bringing them half-way down the hill. That this is not always successful is illustrated by the circumstances preceding the movement of the first flock. Here the ewes were moved from the "open mountain" to improved pastures at a slightly lower elevation (about 100 ft. down) about 3 to 4 weeks before they were transferred to the lowlands. This change was still far too abrupt in the weather and pasture conditions prevailing in the very mild winter and spring of 1956-7.

Acknowledgments.—The authors wish to thank Messrs. J. N. Morgan Hills and D. McLeod who drew attention to the flocks, the members of the Biochemistry Department at the Central Veterinary Laboratory, Weybridge, who carried out the analyses of the blood samples, and Mr. J. L. McGirr and Miss C. N. Hebert who scrutinised the figures in Table 1.

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Monofilament Nylon and Laparotomy Wound Repair in the Dog

BY
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SUMMARY.—Fifty unselected midline laparotomy wounds were repaired with monofilament nylon. The technique of repair and sizes used are described. Successful results were obtained in all the 50 cases and the use of nylon in the buried situation demonstrated.

NYLON, a synthetic plastic, appears to have been a popular, well-tried skin suture material for some years and, in the single form, most veterinary surgeons are likely to have some experience in its use. As a buried suture, however, doubt has been thrown upon its desirability as the tissue reaction is stated to be slightly more than that of silk. Furthermore, suture abscesses are known to have been produced. Nevertheless, there is reason to believe monofilament nylon is now being used more commonly as a buried suture and, for this reason, a limited clinical investigation was thought to be worthwhile.

The observations recorded are upon 50 consecutive midline laparotomies in the dog carried out under ordinary surgical aseptic conditions. Monofilament nylon only was used to close the abdomen.

TABLE I
MONOFILAMENT NYLON

Size	Diameter	Breaking strain
1	0.004—0.006 in.	0.8 lb.
2	0.006—0.008 „	1.7 „
3	0.008—0.010 „	2.8 „
4	0.010—0.012 „	4.0 „
5	0.012—0.014 „	5.0 „
6	0.014—0.016 „	7.0 „
7	0.016—0.018 „	8.5 „
8	0.018—0.020 „	10.0 „

Tables appropriate to the observations are appended. Cases No. 1, 24, 30, 34, and 43 were dogs, the remaining 45 animals being bitches. Of the 30 cases of ovariohysterectomy, 25 were performed on unwell bitches affected with pyometra. Patient No. 23 was also suffering from exudative peritonitis. It will be seen that the majority of the operations involved incision or excision of a viscus in animals likely to have had subnormal healing powers.

The incisions were made through skin, fascia, and then, as precisely as possible, within the limits of the linea alba directly to the abdominal cavity. The average length of the incisions was approximately half of the total length of the linea alba. That is, an incision long enough in the sense of those surgical requirements necessary to minimise traction on an abdominal viscus.

Using a cutting needle of suitable size the suture was taken in and out to include fascia, ventral rectus sheath, edge of rectus muscle with combined dorsal sheath, and peritoneum. Sutures were spaced such that 7 or 8 were usually required to close a 4-inch wound. The sutures were tied in a surgeon's knot with an additional locking throw. A second row of interrupted sutures approximated the subcutaneous tissues to take up "dead space." A third row sometimes including a gauze pad approximated the skin only.

TABLE II
REASONS FOR LAPAROTOMY

Ovariohysterectomy	Cystotomy	Caesarean section	Gastrotomy
2, 3, 4, 5, 7, 8, 9, 11, 12, 15, 18, 21, 22, 23, 26, 29, 31, 32, 37, 38, 40, 41, 42, 44, 45, 46, 47, 48, 49, 50.	6, 14, 17, 20, 25, 28, 36.	13, 16, 27, 33, 39.	1, 24, 34.

Enterotomy	Exploratory	Repair ruptured diaphragm
10, 35, 43.	19.	30.

TABLE III
AGE IN YEARS

Under 1	1–2	2–3	3–4	4–5	5–6	6–7
10, 30, 34, 47.		13, 14, 24, 27, 28.	1, 16, 43.	5, 6, 11, 15, 50.	26, 39, 45.	25, 32, 35, 41,

7–8	8–9	9–10	10–11	11–12	Unknown
3, 7, 12, 19, 21, 23, 29, 35, 37, 46, 49.	33, 40, 48.	2, 4, 8, 17, 20, 42,	9, 18, 44.	22, 38,	31.

TABLE IV
BODYWEIGHT IN POUNDS

Under 20	20–30	30–40	40–50	50–60	60–80	Over 80
3, 4, 9, 10, 16, 22, 28, 29, 33, 47, 50.	6, 14, 17, 23, 25, 27, 34, 42, 45.	2, 11, 12, 19, 20, 26, 31, 36, 39, 40,	15, 21, 35, 38, 41, 48.	32, 43, 49.	1, 7, 8, 13, 24, 30, 37.	5, 18, 44, 46,

In all the operations the sizes of monofilament nylon used were:—

First row. Numbers 4, 6, and 8. The choice was discretionary but it is likely numbers 3, 5, or 7 would have proved equally effective within the limits of the investigation. Care was taken that tension on the sutures was sufficient only to approximate the divided tissues, but at the same time insure as far as possible against risk of incisional hernia.

Second and third row. In all the animals No. 4 material was used.

TABLE V

SIZE OF MONOFILAMENT NYLON USED FOR REPAIR OF LINEA ALBA

No. 4. Green	No. 6. Blue	No. 8. Green
3, 4, 6, 9, 10, 11, 12, 16, 17, 22, 23, 25, 29, 33, 34, 36, 42, 45, 47, 50. (14)	2, 5, 7, 8, 15, 19, 20, 21, 26, 27, 28, 31, 35, 39, 40, 43, 48. (14)	1, 13, 18, 24, 30, 32, 37, 38, 41, 44, 46, 49.

Results

Post-operatively there has been a minimum of reaction and the healing of the laparotomy has been complete. Skin sutures were removed about 7 days after operation and all wounds healed by first intention except the one case mentioned below. The animals have shown no evidence of discomfort at any time, the linea alba and subcutaneous sutures becoming encapsulated in a small fibrous capsule. The sutures can be felt beneath the skin and are palpably inert. Some of the animals were operated on more than 2 years ago and no reaction at all has been observed.

Case No. 14 deserves special mention as the findings were unique. The animal was a very fat bitch and underwent cystotomy in March, 1956. On this occasion the healing was uneventful. In May, 1957, the bitch was presented again for cystotomy on account of calculi recurrence. A laparotomy incision was made through the same line as before. The previous buried sutures were removed and the repair was similar using No. 4 nylon. A week after the operation it was obvious that ventral rupture had taken place beneath the skin. A further operation was performed when it was found that the thin nylon had pulled through the tissues. This was brought about by the very fat and friable tissues and an inadequacy of tissue incorporated in each suture. The rupture may also have been predisposed by previous surgical incision of the same area. Adhesions were broken down and the linea alba approximated with No. 6 nylon. Recovery and healing was then complete and successful. The misadventure in this one case was possibly attributable to the surgeon not selecting the suitable size of nylon under the special circumstances prevailing.

Conclusions

The general result of these observations is that No. 4 monofilament nylon appears suitable for linea alba approximation in dogs of less than 30 lb. bodyweight. No. 6 nylon is probably the most suitable size for dogs weighing between 30 and 50 lb., although one dog weighing 126 lb. was successfully repaired. No. 8 nylon is the size of choice in dogs over 50 lb. bodyweight.

Monofilament nylon used in the circumstances described appears very satisfactory in the repair of midline laparotomies in the dog.

Acknowledgements.—Mr. G. C. Knight for his co-operation and advice and to Imperial Chemical Industries (Plastics Division) who were the manufacturers of the material used and who kindly supplied the technical details.

(*Concluded at foot of adjoining column*)

Monofilament Nylon and Laparotomy Wound Repair in the Dog.—*Concluded.*

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Leptospira pomona Antibodies in the Sera of Pigs: A Preliminary Report

BY

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SUMMARY.—A survey for the presence of leptospiral antibodies was carried out on 914 *pig sera with* L. icterohaemorrhagiae, L. canicola, L. gryppotyphosa, L. hyos, *and* L. pomona *as antigens. Of this number* 533 (58.9 *per cent.*) *contained specific antibodies. With* L. icterohaemorrhagiae *antigen reacted* 226 *sera* (23.63 *per cent.*), 70 *samples* (7.6 *per cent.*) *were positive with* L. pomona *alone,* 25 *sera* (2.7 *per cent.*) *contained antibodies for* L. canicola *alone.* 205 *samples reacted with* L. icterohaemorrhagiae *and* L. pomona, *and* 12 *sera showed antibodies for* L. pomona *and* L. canicola. *The serological evidence presented in this paper indicates that in addition to* L. icterohaemorrhagiae *and* L. canicola, *already reported by other workers, infection of pigs with* L. pomona *seems to be present in this country.*

The author would appreciate the co-operation of veterinary surgeons and would be grateful for samples of pig blood (3 *to* 5 *ml. of clotted blood), particularly from herds where some breeding difficulties have been experienced.*

UNTIL 1937 only a few serological types of Leptospira were known, with *L. icterohaemorrhagiae*, the aetiological agent of Weil's disease, as the classical representative of the genus. In that year Clayton *et al.* isolated a new type, *L. pomona*, from a Queensland farmer. Johnson (1939) while looking for a carrier animal of this pathogen tested sera of various farm animals. Out of 250 sera from

clinically healthy pigs he found 41.5 per cent. containing antibodies to *L. pomona*. This finding was followed by the isolation of *L. pomona* from pig kidneys by various workers (Mochtar, 1940; Johnson, 1942). Subsequently Gsell (1946) proved that the aetiological factor in swineherd's disease of man was not a filter-passing agent but *L. pomona*. According to his observation 59 per cent. of the pig sera collected in the areas where swineherd's disease was prevalent contained *L. pomona* antibodies, whilst invariably negative results were obtained with those from districts where the disease was unknown. An interesting review of the serological surveys for leptospirosis in pigs was published by Keast *et al.* (1956). In his own survey on 487 serum samples collected at random he found 25 per cent. positive with *L. pomona* and 6 per cent. with *L. hyos*. The pig sera from herds with history of abortion, however, contained *L. pomona* antibodies in 94 per cent. and *L. hyos* in 87 per cent. Investigations of recent years supply enough convincing evidence that porcine leptospirosis, and that caused by *L. pomona* in particular, reported from over 20 countries, has become an important disease (Ryley, 1956). About 40 serotypes have been described already, but in Great Britain only *L. icterohaemorrhagiae* and *L. canicola* have been diagnosed (Stuart, 1946; Broom, 1951; Field & Sellers, 1951; Nisbet, 1951; Seiler & Norval, 1956; Coghlan *et al.*, 1957).

The present paper reports what is believed to be the first serological evidence suggesting the presence of *L. pomona* in pigs in this country.

Materials and Method

Antigens. Live organisms of *L. icterohaemorrhagiae*, *L. canicola*, *L. gryppotyphosa*, *L. hyos* (*mitis*), and *L. pomona*, cultivated in Stuart's modification of Schüffner's medium, were used as antigens throughout the whole survey. All these types were obtained from Dr. Broom's Laboratory. Only vigorously growing cultures, 5 to 7 days old, were used for the agglutination-lysis tests. The antigens were regularly tested for their specificity. The method adopted for the setting up of the tests was that described by Wolff (1954).

Sera. In the first part of the survey 314 samples of pig sera were collected at random from normal pigs slaughtered in 4 abattoirs in the South-west of Scotland. These samples represented many herds. The results were encouraging, and therefore the investigation was continued. For the second part of the survey the sera were also obtained from abattoirs in various parts of the country, but arrangements were made so that when a serum was found to contain leptospira antibodies the farm from which it came could be traced. It was hoped this would facilitate the isolation of the organism. Blood samples from only 2 to 15 pigs coming from the same piggery were collected at the time of slaughter. Altogether 914 serum samples, originating from over 100 farms in different parts of the British Isles have so far been examined.

Methods

Dilutions of sera were made in sterile physiological saline solution and in the preliminary screening tests only 4 dilutions which, after the addition of corresponding antigens, amounted to 1/10, 1/30, 1/100, and 1/300, were set up. The mixtures were then incubated at 37° C. for 4 hours, after which time the results were read using dark-ground microscopy with a $\frac{1}{6}$-inch objective. If a serum was found to be positive with *L. pomona* antigen in particular, and often with the other antigens also, the test was invariably repeated and further dilutions made when necessary. The reaction was considered positive when at least 50 per cent. of the antigen was lysed with the exception of 1:10 dilution where only complete lysis was recorded. A serum dilution showing this reaction was considered as its titre.

Results

The results of the serological survey are shown in Table I.

Out of 914 serum samples examined 376 (41.1 per cent.) were negative, whilst 538 (58.9 per cent.) contained leptospiral antibodies. Of this number 226 samples (23.63 per cent.) showed positive reaction with *L. icterohaemorrhagiae* alone, 25 sera (2.7 per cent.) contained *L. canicola* antibodies, 70 samples (7.6 per cent.) reacted positively with *L. pomona* alone, 205 (22.4 per cent.) contained antibodies to both *L. icterohaemorrhagiae* and *L. pomona* and 12 sera (1.3 per cent.) were positive with *L. canicola* and *L. pomona* antigens. Thus the total number of sera which reacted with *L. pomona* alone and with *L. icterohaemorrhagiae* and *L. canicola* was 287 (31.4 per cent.). According to present knowledge *L. pomona* is antigenically distinct from other serotypes. Some of the sera positive with *L. pomona* were stored in a frozen state and re-examined at a later date with similar results. Dr. J. C. Broom kindly examined 3 of them and confirmed the diagnosis. It is interesting to observe that not a single serum sample reacted positive with either *L. gryppotyphosa* or *L. hyos* even in the lowest serum dilution. The comparatively high proportion of positive reactions may be explained by the fact that all positive readings, even in the lowest serum dilutions, were recorded. (See Table II overleaf.)

TABLE I

Number of sera examined	Antigens							Total positive	Total negative
	L. icterohaemorrhagiae	*L. canicola*	*L. gryppotyphosa*	*L. hyos*	*L. pomona*	*L. icterohaemorrhagiae* and *pomona*	*L. canicola* and *pomona*		
914	226	25	—	—	70	205	12	538	376

Tuberculosis in a Horse Caused by the Avian Type Tubercle Bacillus

BY

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AND

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Tredegar

TUBERCULOSIS is not apparently a common disease in the horse. Feldman reviewed the literature up to 1938 and observed that although in the majority of horses with tuberculosis in which the type of infecting organism had been studied the disease was caused by tubercle bacilli of the bovine type, a few cases had been recorded in which avian type tubercle bacilli had been demonstrated, namely those of Nocard (1896), M'Fadyean (1918), and Werdelin (1935). Griffith (1928) was inclined to doubt the authenticity of the claim that the avian tubercle bacillus had been responsible for the lesions in the horse described by Nocard. Griffith (1937) reported on the 55 cases of tuberculosis in horses in England which had been studied up to that time and mentioned that bovine tubercle bacilli were isolated in all except 2. In these, tubercle bacilli of the human type were obtained from one horse and avian tubercle bacilli from the other (M'Fadyean, 1918).

Since then Langvad-Nielsen (1940) and Foschi (1946) have reported cases of avian type tuberculosis of the lungs of the horse, whilst spontaneous tuberculosis in a mule with cutaneous and pulmonary localisations was described by Pellegrini (1949), the organism isolated being of the avian type.

The purpose of this article is to record a further

Leptospira pomona **Antibodies in the Sera of Pigs: A Preliminary Report.**—*Concluded.*

Discussion

From the results obtained it is not surprising to observe the high incidence of *L. icterohaemorrhagiae* antibodies in pig sera which can be accounted for by the common infestation of piggeries with rats, the natural carrier of this pathogen. Sera from a few farms contained a high titre of *L. canicola* antibodies. These two pathogenic leptospira have been reported in pigs in this country previously (Field & Sellers, 1951; Nisbet, 1951; Seiler & Norval, 1956; Coghlan *et al.*, 1957). Positive reactions with *L. pomona* antigen were obtained in 31.4 per cent. of samples examined. It is evident from the above Table that the largest number of positive reactions fall in the serum dilutions 1:30 and 1:100. In view of the fact that there is a wide difference of opinion among many workers who have arbitrarily selected certain titres, *e.g.* Johnson 1:10, Keast 1:300, as an indication of specific infection, it is difficult to offer, at present at any rate, any interpretation on the significance of reactions in these lower serum dilutions. Even if we disregard the reactions in dilutions up to 1:100 those above that dilution give a strong suggestion on the existence of *L. pomona* in pigs in this country. Some information on the persistence of antibodies in artificially infected pigs with *L. pomona* has been supplied by Ryley (1956); however, further work is being carried out to elucidate this problem.

Acknowledgments.—I wish to express my gratitude to Dr. J. C. Broom of the Wellcome Laboratories for supplying the strains of Leptospira, and for confirmation of the diagnosis on pig sera; to Dr. M. A. Soltys for his advice and help in the preparation of this paper; and to Professor J. W. Emslie for his interest in the work. I wish to thank Miss Doreen Cowan and Mrs. Ellen Leighton for their technical assistance. My thanks are also due to all the veterinary colleagues who provided the blood samples.

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TABLE II

Antigens	Serum dilutions							Total positive
	1 : 10	1 : 30	1 : 100	1 : 300	1 : 1,000	1 : 3,000	1 : 10,000	
L. icterohaemorrhagiae	43	169	167	39	8	3	2	431
L. canicola	—	—	8	8	7	12	2	37
L. pomona	45	149	81	9	3	—	—	287

case of tuberculosis in the horse, in which the unusual nature of the lesions is of interest and in which the organism isolated has been shown to be *Mycobacterium tuberculosis*, avian type.

History

The subject was an 8-year-old horse weighing about 12 cwt. owned by the National Coal Board, purchased as a 4-year-old and from that time worked and stabled underground except for 2 weeks every summer when the horses were put out to grass with no direct contact with other livestock. In March it was noticed that 2 swellings had developed on the limbs. One was on the front of the off hind fetlock, approximately 2 cm. in diameter, ulcerated, with a raised edge, and the other over the flexor tendons of the metacarpus of the near fore limb, slightly smaller in size, of firm consistency, painless, and with no heat. The prepuce was swollen with several raised areas within it. The horse was in good bodily condition.

Further lesions developed on all 4 limbs below the knees and hocks during the next few months. Most of the lesions were firm and up to 3 cm. in diameter but some were soft and later ulcerated. The original ulcerated lesion on the off hind fetlock healed leaving a hairless area, but the others showed no sign of regression. By July the animal had developed a slight cough and nasal discharge which became more marked in August when the submaxillary lymph nodes were swollen and there was some subcutaneous oedema under the abdomen and thorax. A swelling of approximately 6 cm. diameter developed just below the jugular furrow in the middle third of the neck on the near side. At no time were the lymphatic vessels prominent.

A nasal swab was taken at this time but no significant organisms were demonstrated. A little blood-stained fluid was obtained with a needle and syringe on 2 occasions from one of the swellings but no significant organisms were found in films stained by Gram, Giemsa or Ziehl-Neelsen, and no growth was obtained on blood agar plates.

Various wound dressings including chloromycetin ointment applied to the open lesions on the limbs, and penicillin given intramuscularly had no effect. No other antibiotics were used.

During the whole course of the disease the horse fed well but began gradually to lose condition at the end of July and this continued until the horse was destroyed early in September.

Post-mortem Findings

On *post-mortem* examination various lymph nodes including the submaxillary, retropharyngeal, mediastinal and mesenteric nodes were found to be enlarged and contained lesions with thick, greyish-yellow pus. Ulcerated lesions were present in the mucosa of the trachea, and the liver was cirrhotic with pinhead lesions containing yellow pus throughout its substance. Pale, diffuse, consolidated areas were present in the lungs. There was a large tumour-like mass in the abdominal cavity, apparently arising from the small intestine. The skin and preputial lesions had well marked fibrous capsules and contained yellow pus.

Portions of lung, trachea, liver, lymph node and skin were submitted for laboratory examination.

Laboratory Tests

Very numerous small, pleomorphic, acid-fast bacilli were found in films of the lesions from all the above specimens.

Material from the lesions was pooled and inoculated intramuscularly into 2 guinea-pigs. Single intradermal comparative tuberculin tests were carried out on the guinea-pigs 3 weeks after inoculation and both animals gave specific avian reactions. The guinea-pigs were examined at necropsy 6 weeks after inoculation. The lymph nodes local to the site of inoculation were enlarged and caseous and there were several lesions in the spleen of both animals. Acid-fast bacilli were seen in films of the lesions in both lymph nodes and spleen.

The pooled material from the horse lesions was also inoculated into Dubos liquid medium. After 3 weeks' incubation the medium contained numerous pleomorphic acid-fast bacilli. These were subcultured on to Dorset's egg, Lowenstein-Jensen and Stonebrink media, on all of which the growth and morphology of the colonies were characteristic of the avian type tubercle bacillus.

Further animal inoculations were carried out with cultures. Four guinea-pigs were inoculated intramuscularly with 1 mg. of culture, one rabbit intravenously with 0.01 mg., and one chicken intravenously with 1 mg. Tuberculin tests were carried out on the guinea-pigs 3 weeks after inoculation and all showed a specific avian sensitivity. The guinea-pigs were killed 6 weeks after inoculation and necropsy revealed caseous lesions in the inguinal and lumbar lymph nodes of all 4. There were no apparent lesions elsewhere. The rabbit died 74 days after inoculation with generalised lesions of tuberculosis. The chicken died 35 days after inoculation and revealed generalised lesions of tuberculosis at autopsy. Avian type growth was also recovered on culture media from lesions found in the guinea-pigs, rabbit and chicken.

From the results of these biological and cultural tests the organism was classified as *M. tuberculosis*, avian type. It is considered that the rather widespread lesions found in the original biological tests in guinea-pigs were probably the result of inoculations with extremely large numbers of organisms direct from the lesions in the horse tissues.

Histopathology

Material was selected for histological examination from the skin, liver, lung, trachea and lymph nodes.

Lymph node. Diffuse large cell proliferation was present with large numbers of lymphocytes. There were numerous giant cells of varying size in the proliferating areas. The numbers and disposition of their nuclei varied from 2 to 12 or more grouped centrally, at one or other pole, or arranged around the periphery. In parts there were extensive areas of necrosis with streaks of fibrous tissue around their periphery. Numerous acid-fast bacilli were present and most of the giant cells were packed full with these organisms.

Lung. There were extensive areas of cellular infiltration with epithelioid cells, lymphocytes, polymorphonuclear leucocytes, and a few giant cells and acid-fast bacilli. There was little evidence of necrosis.

Liver. There was no recognisable hepatic tissue present in the sections. There were areas of marked fibrosis with diffuse large cell proliferation and large numbers of lymphocytes, numerous giant cells packed with acid-fast bacilli, and some small areas of necrosis.

Skin. Necrotic areas were present in the dermis and subcutis with fibrous capsules and diffuse cellular proliferation. There were a few giant cells in the proliferating parts. Nuclear residues of lymphocytes and polymorphonuclear leucocytes and a few acid-fast bacilli were present in the necrotic foci.

Trachea. The mucous membrane was ulcerated with complete loss of epithelium. Areas of cellular proliferation and necrosis were present in the submucous coat with numerous giant cells and masses of acid-fast bacilli.

The main features of the histopathology of the above lesions are the pronounced epithelioid cell proliferation and giant cell formation and, except in the skin and lung lesions, the large numbers of acid-fast bacilli present.

Discussion

The site of primary infection in the case described is not known but it is probable that infection occurred by the alimentary tract.

Detailed *post-mortem* examinations are carried out on few of the horses which die or are killed in Britain, and it would be impossible to estimate the incidence of equine tuberculosis in this country. With the rapid progress being made in the eradication of tuberculosis in cattle, a reduction in tuberculosis in horses may be expected although avian type infection will probably still occur.

Except for "skin tuberculosis" in cattle, lesions of tuberculosis on the skin of animals is rare but a number of cases occurring in the horse have been reported in the literature. The most common sites of lesions are the legs, abdomen, chest and prepuce, although at the same time there may be lesions of the internal organs, and it would appear that skin tuberculosis of the horse is usually of a metastatic nature. In many of the reported cases the organism has not been typed so it is not known what the incidence of avian type infection in these skin cases might be.

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The Benjamin Ward Richardson Lecture, 1957

THE Benjamin Ward Richardson Lecture was delivered by Mr. Horace Thornton, B.V.SC., M.R.C.V.S., D.V.H., F.R.S.H., Chief Veterinary Officer, Newcastle upon Tyne, at a meeting held in the London Headquarters of the Royal Society of Health on Wednesday, December 11th, 1957. The speaker was introduced by Professor Harold Burrow, M.R.C.V.S., D.V.S.M., past-President of the Society. The following is a summary of Mr. Thornton's paper, published by courtesy of the Society:—

It is often said that the meat inspector working in the abattoir is able to provide information valuable to the research worker and conversely the inspector is frequently in need of guidance on some of the conditions and problems which he encounters. There is insufficient liaison between them at the present time and the rural inspector is often more isolated than his urban colleague. This paper draws attention to some of the problems encountered in slaughterhouses in Newcastle in the hope that they may be of interest to the research worker and perhaps lead to their investigation.

I.—The so-called slaughter spleen in cattle and pigs

Some years ago *post-mortem* inspection of animals in one slaughterhouse revealed a number of cattle which exhibited enlarged and congested spleens. The cut surface of the spleen appeared to bulge, revealing a dark-red pulp from which blood flowed freely. The carcases were otherwise normal and microscopic examination for the presence of anthrax was negative. Reference to German literature showed that a condition called "bloody spleen" or "slaughter spleen" had been described by several observers. They referred to a co-existing congestion of the liver, kidneys, and small intestine. "Slaughter spleen" was also described in pigs.

Further investigation at the slaughterhouse revealed that the normal 4-ft. pithing canes had recently been replaced by 5-ft. canes. A 5-ft. cane will reach the region of the 4th lumbar vertebra and will destroy all the nerve roots arising from the thoracic portion of the spinal cord, including those supplying the liver, kidneys, intestines, and spleen, causing vaso-dilatation of the blood vessels. Following a reduction of the 5-ft. pithing cane to half its length, the occurrence of "slaughter spleen" ceased in this particular slaughterhouse.

It is not suggested that 5-ft. pithing canes are the only cause of "slaughter spleen"; occasionally it has occurred after use of the shorter cane and it also occurs in pigs which are not pithed after stunning. Research into this phenomenon is needed as there is always a danger that the condition may be confused with anthrax or some other septicaemic condition.

II.—Scaling of the carotid artery in cattle slaughtered by the ritual method

For many years ritual slaughter has been the subject of controversy and its effectiveness in producing immediate insensibility was questioned by a Committee appointed by the Admiralty as far back as

1904. Two factors which might be borne in mind by the research worker who investigates the humaneness of this method are: (a) recently developed techniques for demonstrating the existence of consciousness by electro-encephalographic means, and (b) the possibility of consciousness being prolonged by spontaneous sealing of the cut ends of the carotid artery.

Although the major blood supply to the brain is through the main carotid artery it is also supplied by the vertebral artery, a branch of the subclavian. During ritual slaughter the main carotid artery is severed, but the vertebral artery is left intact. When the carotid arteries are severed, there is an immediate fall of carotid blood pressure, and if the flow is profuse and uninterrupted, it is doubtful whether the alternative supply would be sufficient to maintain consciousness.

Sometimes, on retraction of the severed ends of the carotid artery, the outer loose aerelar tissue is torn and "bunches" around the proximal end of the cut vessel; this may act as a seal preventing the free escape of blood from the artery. The blood pressure in the anterior aorta will be preserved and the blood supply through the vertebral artery may be sufficient to maintain consciousness.

III.—Colour changes in the liver of slaughtered animals

Light-coloured livers have been encountered in slaughtered cattle, sheep, and pigs which were otherwise normal, and we have attributed this, somewhat empirically, to the fact that the animals were deprived of food and water before slaughter.

The condition has also been seen in sheep which have been worried by dogs and we have been led to believe that any animal subjected to excitement, stress, pain, or hunger may exhibit this liver change on *post-mortem* examination. The phenomenon is most likely due to extra demands made on the glycogen reserves of the liver when muscle glycogen has been abnormally depleted.

This hypothesis is supported by the work of Engdal in Helsinki who links the appearance of light-coloured livers with an abnormally high *p*H of the flesh and therefore a lowering of carcase durability.

IV.—The significance of small haemorrhages in the kidneys of slaughtered pigs

Capillary haemorrhages are due to a variety of causes including septicaemia, toxaemia, and certain vitamin deficiencies. The meat inspector regards these haemorrhages in the kidney and elsewhere as indicative of septicaemia or toxaemia, but they are not uncommonly found in slaughtered pigs which have no other abnormality.

Various explanations have been put forward and two possible causes are (a) the migration of larval forms of *Ascaris lumbricoides*, where fourth-stage Ascaris larvae are swept into general circulation from the capillaries of the lung, and (b) capillary rupture in pigs stunned by electrical means, *i.e.* a local manifestation of the well-known condition "blood splash."

The task of the inspector is facilitated if he remembers that odd haemorrnages in the kidneys of pigs may be attributed to either of these causes, but experience shows that if the haemorrnages are very numerous they may almost invariably be attributed to an infective agent in the blood stream.

V.—Congestion of the bronchial lymph nodes of pigs due to mechanical causes

The bronchial lymph nodes of pigs are normally pale brownish-grey to pale red in colour and of a somewhat soft consistency. Acute infection of the lungs will lead to acute congestion and enlargement of the nodes. In routine meat inspection it is common to find congested nodes which are not enlarged and are unrelated to acute infective changes in the lungs. This occurs particularly in animals which have been electrically stunned and show lung haemorrnages, the extravasated blood having entered the lymph stream and drained into the adjacent lymph node.

VI.—Skin discoloration in pigs due to mechanical causes

It is important that the meat inspector should be able to differentiate between the various skin discolorations seen in slaughtered pigs. Those due to swine erysipelas, pig paratyphoid, or swine fever are well known, but others may be due to intrinsic factors or mechanical influences.

Lime burn or disinfectant burn, causing red patches on the belly and hams of pigs travelling in railway trucks is now rarely seen, but transit erythema, due to cold draughts, sometimes occurs in pigs carried by road. White-skinned pigs may suffer from sunburn (solar erythema) and undue activity before slaughter may also cause skin congestion.

Cases may be seen where pigs are immersed in the scalding tank too soon after being mechanically stunned, and some American authorities record that reddening of the skin may arise from rough treatment by the dehairing machine. If skin discoloration is due to non-febrile causes, it should be remembered that the carcase and viscera will appear otherwise normal; lymph nodes draining a congested area may be suffused with blood but will not be enlarged.

VII.—Bone taint

The cause of bone taint in carcases of cattle and pigs is the subject of much controversy. Fatigue, exhaustion, fright, shock, slow bleeding, or sudden strain are important factors in its aetiology. Rupture of the tendons inserted into the head of the femur has been noticed in some cases of bone taint in beef carcases

Contaminating bacteria may be introduced into the carcase by the sticking knife, or deep lymph nodes may have become infected from scratches in the skin. The position of the head during bleeding may also be an important factor if the free flow of blood is impeded in any way.

Broad spectrum antibiotics injected into animals before slaughter or infused into carcases on the killing floor may provide a solution to the problem of bone-taint, but there are certain dangers attached to their use.

Current Literature

ABSTRACTS

Iodinated Organic Compounds as Radiographic Contrast Mediums in Canine Practice. WILLIAM I. GAY (1957). *J.A.V.M.A.* **131.** 149-54.

This article concerns the various uses to which contrast media have been put in the United States of America. The writer compiles the results of other workers and illustrates each procedure with a radiographic reproduction. A description is given of the application of the various aqueous and oleaginous iodinated compounds as an aid to radiographic definition. Each technique is briefly explained and references to the the original work are given. Anyone who anticipates using the iodine preparations as an aid to canine radiographic diagnosis will find this article a useful beginning. R. C. F.

General Anaesthesia in Birds. SANGER, V. L. and SMITH, H. R. (1957). *J.A.V.M.A.* **131.** 52-5.

On account of the risks which are considered to accompany inhalation anaesthesia in birds, the authors have investigated the use of two products, Combuthal* (drug C) and Equi-thesin† (drug E) which may be administered by intra-muscular injection to produce general anaesthesia in birds. Drug E, a solution containing chloral hydrate, pentobarbital, and magnesium sulphate, was used as supplied by the manufacturers, while drug C, consisting of equal parts of sodium pentothal and sodium pentobarbital, required to be dissolved in sterile water to a concentration of 0.5 g. per ml.

Injection was made into the pectoral muscle and groups of 1-day-old chicks, 5-week-old broilers, and 12- to 20-week-old turkeys. Altogether 38 birds were used for the trial of each preparation.

As a result of previous experience drug C was administered in amounts of 0.5 g. per lb. of bodyweight for the chickens and 1.5 g. per lb. of bodyweight for the turkeys. Drug E was given at a rate of 1.1 ml. per lb. of bodyweight for chickens and 1.3 ml. per lb. of bodyweight for turkeys.

General anaesthesia was produced within a few minutes in the day-old chicks and in 20 to 30 minutes in all other cases, and lasted for approximately 20 to 30 minutes (double this time in the case of the turkeys). There was variation in the depth of anaesthesia produced (no criteria for assessing the depth of anaesthesia are given)—some birds tending to be only lightly anaesthetised. Three of the day-old chicks died, all other birds recovered quietly and completely.

No clinical evidence of local discomfort following the injections was noted, but histological examination of tissue from slaughtered birds revealed considerable inflammatory reaction at the site of injection, and the histological picture of this is described in some detail. However, this reaction was found to clear completely in 10 to 14 days. S. W. D.

* Abbott Laboratories.
† Jensen-Salsbery Laboratories, Inc.

A Safer Technique for Induction of General Anaesthesia in Small Animals. KRAWITZ, L. (1957). *Vet. Med.* **52.** 442-4.

One of the major problems arising from general anaesthesia by means of the barbiturates in small animals has been the small margin of safety. This margin is dependent on the degree of renal efficiency and hepatic function which control the metabolic breakdown and excretion of the barbiturates. In many patients this slow rate of detoxication and excretion will be discovered too late.

In contrast, in other patients, the excretion rate may be very rapid and the patient tends to recover before surgery is complete. An additional dose of barbiturate at this stage might easily put the patient into a stage of anaesthesia from which recovery would be very slow or even impossible.

Any procedure, such as described by the author, which would potentiate, and at the same time reduce the effective dose of barbiturate required, would be desirable. Promazine hydrochloride, one of the newer group of tranquilliser or ataractic drugs has been found to be effective without producing any dangerous or undesirable side effects.

The author describes a simple technique whereby three-quarters of the recommended dose of barbiturate is drawn into one syringe, while into a second syringe is drawn a dose of promazine on the basis of 1.50 to 2.00 mg. per lb. bodyweight. The first half of the barbiturate is injected intravenously at the rate of 1 c.c. per 5 seconds. The second half of the dose is then given at a slower rate until the patient is narcotised, but not free from reflexes. The second syringe is then connected to the needle which is still in the vein and the promazine injected slowly, but the total dose should be given in 30 to 45 seconds. The animal will then be in the stage of surgical anaesthesia. As the promazine is excreted from the body at a slower rate than the barbiturate there is a much calmer return to full consciousness and hardly any interference with the surgical wound.

A table is appended giving the results of 55 cases ranging from major surgical operations to the treatment of eczematous conditions in intractable patients. In every case the results were satisfactory and no fatal results are recorded. J. S. J. L.

The Development of Immunity to Cecal Coccidiosis in the Presence of Nicarbazin. MCLOUGHLIN, D. K., RUBIN, R., and CORDRAY, D. R. (1957). *Poult. Sci.* **36.** 1,003-5.

The use of 0.0125 per cent. of nicarbazin in the food provided almost complete protection against experimental infection with *Eimeria tenella*, given as a single dose of 50,000 oocysts. When the birds were challenged with a further dose of 100,000 oocysts 3 weeks later, it was found that medication had not interfered with the development of natural immunity. E. A. G.

News and Comment

HORMONES IN FEEDING-STUFFS

One of the Divisions of the B.V.A. has expressed anxiety over the wide and often indiscriminate use of hormones in animal feeding-stuffs, and the apparent lack of control of these drugs. It has been noted that they are being used on an increasing scale.

This matter is being discussed by the Technical Development Committee of the Association, and that Committee would be glad to know of any evidence of possible harmful effects of hormones so administered which veterinary surgeons have encountered in practice. Any details which practising veterinary surgeons can provide will be most valuable, and should be sent to the Secretary, the Technical Development Committee, 7, Mansfield Street, London, W.1.

MR. A. P. HAMILTON

The death of Mr. Hamilton occurred on January 8th after a grave illness, borne with fortitude. His funeral took place at Warriston Crematorium, Edinburgh, on January 10th, when a large gathering of friends and colleagues paid their last tributes.

The following neighbouring practitioners attended: Messrs. T. N. Skinner, C. M. Ferguson, and R. G. Low, Kirkcaldy; J. F. Watson, Milnathort; Messrs. J. W. C. Inglis and G. M. Grey, Dunfermline; Mrs. H. M. Wilson, Cupar, representing her husband who was in London; Mr. J. G. Souter, Divisional Inspector, Cupar, Fife, representing the Ministry of Agriculture; and Mr. J. W. Burgess. Representatives were also present from the Dunfermline and West Fife Agricultural Society, Dunfermline Curling Club, of which the late Mr. A. P. Hamilton was a keen and active member, and a large number of the farming community from West Fife.

Mr. Harry M. Wilson writes:—

Mr. A. P. Hamilton was a native of Edinburgh, educated at George Heriot's School and the Royal (Dick) Veterinary College from which he graduated on December 14th, 1926. In his young days he was a cross-country runner and in later years an exponent of the "roaring game" (curling).

He practised for many years from Dunfermline, and leaves a widow and four sons to whom our sympathy is extended.

UNIVERSITY NEWS

Cambridge

Veterinary Examination, First Part
Michaelmas Term, 1957

The following students passed in all three sections, *i.e.* animal pathology and bacteriology, veterinary parasitology, animal health and production:—

R. F. E. Axford, St. John's College; A. J. Bacon, Gonville & Caius College; B. Boswood, Jesus College; A. K. Entwistle, Pembroke College; T. W. Heard, Jesus College; J. McCaig, Trinity Hall; M. Philpott, St. Catherine's College; A. M. Smith, Peterhouse; and R. B. Whiteford, Emmanuel.

R. H. Haydon Jones (Queens' College) passed in animal pathology and bacteriology, and veterinary parasitology only; O. F. Amor (Queens' College) passed in animal health and production only; and R. B. Blatcher (St. John's College) passed in animal pathology and bacteriology.

SIR MERRICK BURRELL

Dr. W. S. Gordon writes:—

Sir Merrick Burrell, Bt., C.B.E., died suddenly, on December 22nd, at his home in Sussex. He was 80.

Merrick Raymond Burrell was born on May 14th, 1877, educated at Eton and succeeded his father as seventh baronet in 1899. His seat was Knepp Castle, near Horsham, Sussex, where his eldest son, Sir Walter Burrell, resides. After serving as a lieutenant in the Boer War, Sir Merrick returned to control his estate in the spacious days before the First World War, when the well-to-do land-owner had an opportunity to bring much benefit to the countryside. His early experience laid the foundations of a quite outstanding knowledge of agriculture, estate management, forestry, and the management and breeding of animals. His great interest in those subjects led him in later life to devote much of his time and energy, with great effect, to the improvement of education and research in agriculture.

He excelled in every form of field sport and to see him in action shooting at the age of 80 with two immaculately trained retrievers, each individually responsive to his every command, was an education in perfection of technique by both man and dog. Sir Merrick was a lover of animals and was fortunate in his great gift of training, managing, and handling them. From 1904 to 1937 he was one of the leading breeders of hunters and author of "Hints on the Breeding and Management of Light Horses." In 1914 he became president of the Hunters Improvement Society and was also president of the Percheron Horse Society. His wealth of experience with horses led to his services being called upon by the Remount Department in the First World War, in which he became lieutenant-colonel, inspector of remounts, and was awarded a C.B.E. He was High Sherriff of Sussex in 1918.

In 1912 he founded the Knepp herd of Red Poll cattle and was president of the Red Poll Cattle Society in 1924 and again in 1953. His cattle won many championships, the most recent being the Royal Show and the National Red Poll Herd Championship in 1956.

He was a trustee of the Royal Agricultural Society of England and president in 1936. From 1925 onwards he was chairman of the Society's Veterinary Committee and instigated and controlled the construction of the Quarantine Station for export of cattle, sheep, and pigs. In 1935 he was chairman of the Agricultural Council of England. He took a leading part in the formation of Young Farmers' Clubs in this country, and for 30 years was closely associated with this movement, being chairman from 1946 to 1951. It was only at the last annual meeting that he resigned as a trustee. He was chairman of the Agricultural Committee of the County Councils Association for several years.

Notwithstanding the many calls on his time for public work on a national scale Sir Merrick devoted much of his energy to the agricultural affairs of his county and was chairman, successively, of the West Sussex County Agricultural Committee and the West Sussex War Agricultural Committee from 1919 to 1949. This was a most exacting task to which he dedicated himself throughout World War II, promising himself two months' holiday in Scotland when the job was done, salmon-fishing on the Spey. This he did, in due course, in splendid fashion by taking the Duchess of Richmond and Gordon's house at Orton on the Spey and invited friends in sequence, to enjoy with him the luxury of salmon fishing under the most perfectly organised conditions. To participate in this for a week was a privilege and experience not likely to be repeated in modern times.

The history of the Royal Agricultural Society of England records the award of the Society's Gold Medal to Sir Merrick in the following terms: "In 1937 the Society selected one of the most active and distinguished members of its own council who had been president in the previous year. Sir Merrick Burrell is one who, like Spencer and Pusey a century earlier, has given himself to the cause of agricultural progress. Among his many services the greatest has been to carry through the reorganisation of veterinary education, research, and administration, to give the veterinary profession the status which it deserves, and to prepare the way for a planned attack upon the problem of animal disease."

Sir Merrick was chairman of the Royal Veterinary College from 1929 to 1946 and carried the responsibility for the demolition of the old college and rebuilding of the new. (He personally never thought it a good idea to build on the old site.) On the formation of the Agricultural Research Council he was appointed chairman of the Animal Diseases Committee, a position he held for 11 years until 1942. The climax of his work in that capacity was the establishment of the Council's research station at Compton in 1937-8. This was the first research station to be established under the direct control of the Council. It had the two-fold object of breeding farm animals and laboratory animals of known health history and of providing accommodation to house farm animals used for the study of disease on a scale not previously possible. He was devoted to Compton and helped in every way he possibly could to aid in its development. He visited the station at monthly intervals right up to the time of his death, and several years ago presented the gates on the front entrance to the institute.

He was a member of the Committee on Cattle Diseases, set up by the Economic Advisory Council, 1932-4, and his reservation to the final report and the memorandum attached to it were largely responsible for the establishment of a veterinary service under the central control of the Minister of Agriculture instead of on a local government basis.

His courageous initiative, far-sighted vision, and firm adherence to his purpose in times of controversy have entitled him to an imperishable place in the history of the development of veterinary education and research. He was indeed a great countryman of unique personality, he lived graciously, and had sampled most things life has to offer. His was a useful and rewarding life and his name and influence will live for ever in the annals of veterinary science in this country and especially for the establishment of the Research Station at Compton.

Tribute by Council R.C.V.S.

The services rendered by Sir Merrick Burrell to the profession were described at the last meeting of the R.C.V.S. Council on January 10th. In referring to them the President said:—

"In addition to his wide agricultural interests in West Sussex, where he raised and maintained a celebrated herd of Red Polls, Sir Merrick, throughout his life, took a very great interest in veterinary education and the profession in general. He was elected a Governor and a member of the General Purposes Committee of the Royal Veterinary College in 1920 and subsequently became its chairman. In 1929, he succeeded Lord Northbrook as chairman of the Governors, and later became chairman of the Executive Council, a post which he continued to hold until 1946.

"The Royal Veterinary College will ever be grateful to him for his encouragement and help in completing the scheme for the new buildings at Camden Town, in which he took such a great pride. He was keenly interested in all College activities. He made a number of generous gifts to the Royal Veterinary College, including the magnificent portraits of George III and his consort which hang in the Assembly Hall.

"He did great things for veterinary science too, as chairman of the Veterinary Committee, Royal Agricultural Society, and as chairman of the Animals Committee of the Agricultural Research Council from 1935 to 1942. I think, therefore, you would agree that on this occasion, when we are paying respect to those of our profession who have passed on, we might well include among our thoughts to-day a tribute to Sir Merrick Burrell and his services to the profession.

"I should like to thank Dr. Montgomerie, who represented myself and this Council at the memorial service."

At the same service the Royal Veterinary College and the University of London were represented by Professor McCunn.

PROCEEDINGS OF CONGRESS, 1957

We are asked to point out that Dr. G. M. Urquhart was a co-author of the paper "The Natural History of Parasitic Bronchitis with Notes on Prophylaxis and Treatment" which was published on pages 1329-36 of the official Proceedings of the 1957 B.V.A. Congress. Through an error in the official programme Dr. Urquhart's name was inadvertently omitted.

MR. RICHARD CLARKE GLOVER

Professor McCunn writes:—

His many friends in England, Burma, and the West Indies will have read with regret of the death of R. C. Glover. He died on December 8th, 1957. He was born on May 7th, 1883, in West Ham, where his father, Richard Glover, Fitzwygram medallist of 1877, had a very large horse practice.

Glover was educated at St. Bonaventure's and Parmenter's schools and then went to the Royal Veterinary College. He graduated M.R.C.V.S. on May 7th, 1904, but I think that he had passed his final examination during the previous year and had to wait until he reached the age of 21 before his name could be placed on the Register. He joined his father in the practice at Stratford (London). It was soon evident that he was not happy in the East End practice, and it was not long before he set sail for Burma and Rangoon. He was veterinary surgeon to the Rangoon Turf Club and he also conducted a private practice. He built up a great reputation as an equine practitioner and there is no doubt that his experience amongst the teeming population of horses in the East End of London laid the foundations of a fund of knowledge which stood him in good stead for the rest of his life. He practised in Rangoon for almost 50 years until the Japanese occupation in World War II.

Life in the East suited Glover and his wife. He served in the Defence Force from 1910 to 1936 and he was awarded the V.D. decoration. He served in the A.V.C. during the 1914-18 war. When the Japanese overran Burma everything went to pieces; he lost his home and all his equipment, and was forced to trek overland to India. The story of his hardships and trials in this supreme effort is a truly great one. Ultimately he got to Delhi and immediately joined the Veterinary Corps, now R.I.A.V.C., and served from 1942 to 1946.

After the war he returned to England and lived for some time near Godstone. He made the best of life and did not complain, as many men might have done, about his great loss and the hardships he had endured. In 1951 he went to Jamaica in the West Indies taking up an appointment as veterinary officer in the Department of Agriculture. He remained in Jamaica until 1955.

R. C. Glover did much to enhance the prestige of the veterinary profession in the East; he saw his life's work destroyed by a barbarous enemy, but by his fortitude and resilience he set an example to all.

THE CENTRAL VETERINARY SOCIETY

The next meeting of the Central Veterinary Society is to be held on February 6th at the Royal Veterinary College by kind permission of the Principal. The title of the meeting is "The Patient, the Client, and the Veterinary Surgeon." and it will take the form of a discussion on the client/practitioner relationship by a forum consisting of Miss J. O. Joshua; Mr. W. G. R. Oates, Secretary and Registrar of the Royal College of Veterinary Surgeons; Mr. T. A. R. Chipperfield, Barrister-at-Law; and Mr. H. F. C. Hebeler, junior vice-President of the B.V.A.

"SLIGHTLY CRAZY FOR CHOICE"

There is something more than usually intriguing about a classified advertisement which appeared in this journal last week. The principal concerned desires to find himself an assistant not only with the customary abilities, but "slightly crazy for choice"; and the mind toys pleasantly with speculations upon what passed in the principal's mind before requiring this singular qualification.

There are degrees of craziness, and it is not certain what limit, if any, is set. Will no more be asked of the successful candidate than a mild, even a benevolent, crankiness like that of Mr. Dick? Is a more spacious and opulent eccentricity called for in the manner of Prince Florizel? Or could it be that our advertiser is on the look-out for something really recherché, like the old gentleman in small clothes who declared his passion to Mrs. Nickleby by pelting her with vegetables over the garden wall?

"The poet's eye," Shakespeare reminds us, "in a fine frenzy rolling, glances from heaven to earth, from earth to heaven." The profession has its poets (though we have churlishly rejected a good many of their offerings as being frivolous at inopportune moments) and perhaps it is one of these who, all unknown to himself, is about to find his métier. May the moon shine upon him with particular serenity.

The appointment, it is noticed, is in a small-animal practice. Perhaps a learned contributor will prepare a paper (with graphs and tables) demonstrating that cats and dogs are more indulgent (or less inimical) towards the "slightly crazy" than are cattle and sheep. And how do pigs and poultry react? Really, the subject has endless possibilities.

R.C.V.S. OBITUARY

FLODIN, Peter Magnus, Leeston, Canterbury, New Zealand. Graduated December 14th, 1940, at the Royal (Dick) Veterinary College, Edinburgh. Died December 23rd, 1957.

The Chairman of the Veterinary Surgeons' Board of New Zealand writes:—

Mr. Flodin passed away very suddenly on December 23rd, 1957, while on an inspection visit to a farm near Wellington. During the last few years Mr. Flodin has been with the Animal Industry Division of the Department of Agriculture. His sudden death was a great shock to all who knew him.

PERSONAL

Mr. Norman Comben has been appointed Principal of the advisory department of the Animal Feeds Division of Quaker Oats Ltd.

Mr. B. K. Fenton has resigned from the staff of the Royal Veterinary College at Streatley and joined Mr. I. W. Tallantire in private practice.

COMING EVENTS

January

29th (Wed.). Meeting of the B.S.A.A. Midland Region at the Radbrook Hall Hotel, Radbrook Road, Shrewsbury, 2.30 p.m.

Ordinary General Meeting of the Southern Counties Veterinary Society at the Red Lion Hotel, Salisbury, 7 p.m.

31st (Fri.). Annual General Meeting of the Yorkshire Veterinary Society in the Hotel Metropole, Leeds, 1, 2.30 p.m.

February

5th (Wed.). General Meeting of the Midland Counties Veterinary Association at the Birmingham Medical Institute, 36, Harborne Road, Birmingham, 15, 2.45 p.m.

Meeting of the Lancashire Veterinary Association in the University Veterinary Hospital, Liverpool, 2.30 p.m.

6th (Thurs.). General Meeting of the Central Veterinary Society at the Royal Veterinary College, Camden Town, N.W.1, 6 p.m.

7th (Fri.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

Annual Ball of the Glasgow University Veterinary Medical Association in the Rhul, Sauchiehall Street, Glasgow, 8 p.m.

12th (Wed.) Meeting of the West of Scotland Division at the University School of Veterinary Science, Garscube, Bearsden, Glasgow, 2.30 p.m.

Meeting of the R.A.V.C. Division at the Central Veterinary Laboratory, New Haw, Weybridge, Surrey, 2.15 p.m.

14th (Fri.). General Meeting of the Society for the Study of Animal Breeding at the B.V.A., 7, Mansfield Street, Portland Place, London, W.1, 11 a.m.

Joint Meeting of the Society of Practising Veterinary Surgeons and the Shropshire Veterinary Club at the Radbrook Hall Hotel, Shrewsbury, 7.30 p.m.

General Meeting of the Society of Practising Veterinary Surgeons in the Radbrook Hall Hotel, Shrewsbury, 8 p.m.

19th (Wed.). Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Society's House, 5 p.m.

20th (Thurs.). Ordinary Meeting of the Ayrshire Veterinary Association in the Ailsa Lounge, Ayr Station Hotel, 2.30 p.m.

27th (Thurs.). Meeting of the Essex Veterinary Society at the Essex Institute of Agriculture, Writtle, Essex, 7.30 p.m.

FOOT-AND-MOUTH DISEASE

The areas described below are declared to be Infected Areas for the purpose of preventing the spread of foot-and-mouth disease:—

IN THE COUNTY OF DEVON

The City and County Borough of Exeter.

The Borough of Torquay.

Petty Sessional Division of Teignbridge: The parishes of Ashburton, Ilsington, Bovey Tracey, Hennock, Trusham, Chudleigh, Kenton, Powderham, Dawlish West, Dawlish East, Mamhead, Ashcombe, Teignmouth, Bishopsteignton, Ideford, Kingsteignton, Teigngrace, Highweek, Bickington, Ogwell, Wolborough, Milber, Haccombe with Combe, Stokeinteignhead, St. Nicholas, Kerswells, Coffinswell, Ipplepen, Torbryan and Woodland.

Petty Sessional Division of Paignton: The parish of Marldon.

Petty Sessional Division of Totnes: The parish of Broadhempston.

Petty Sessional Division of Woodbury: The parishes of Littleham, Withycombe Raleigh, Lympstone, Woodbury, Clyst St. George, Clyst St. Mary and Sowton.

Petty Sessional Division of Wonford: The parishes of Christow, Ashton, Kenn, Exminster, Topsham, Shillingford St. George, Doddiscombsleigh, Dunchideock, Ide, Alphington, Holcombe Burnell, Whitestone and Pinhoe.

Petty Sessional Division of Crockernwell: The parishes of Manaton, Lustleigh, Moretonhampstead, Bridford, Dunsford, North Bovey and Tedburn St. Mary.

Petty Sessional Division of Axminster: The parish of Hawkchurch.

IN THE COUNTY OF DORSET

The Borough of Bridport.

Petty Sessional Division of Bridport: The parishes of Wootton Fitzpaine, Charmouth, Catherston Leweston, Stanton St. Gabriel, Chideock, Symonsbury, Allington, Bradpole, Bothenhampton, Burton Bradstock, Shipton Gorge, Chilcombe, Askerswell, Loders, Powerstock, North Poorton, Hooke, Mapperton, Corscombe, West Chelborough, East Chelborough, Chedington, South Perrott, Mosterton, Seaborough, Broadwindsor, Beaminster, Netherbury, Stoke Abbott, Whitechurch Canonicorum, Marshwood, Bettiscombe, Pilsdon, Thorncombe and Burstock.

Petty Sessional Division of Dorchester: The parishes of Swyre, Puncknowle, Long Bredy, Kingston Russell, Winterbourne, Abbas, Frampton, Sydling St. Nicholas, Up Cerne, Frome St. Quintin, Evershot, Melbury Sampford, Rampisham, Wraxall, Cattistock, Chilfrome, Toller Porcorum, Toller Fratrum, Frome Vauchurch, Maiden Newton, Wynford Eagle, West Compton, Litton Cheney and Compton Valence.

Petty Sessional Division of Sherborne: The parishes of Batcombe and Melbury Bubb.

IN THE COUNTY OF SOMERSET

The Borough of Chard.

Petty Sessional Division of Ilminster: The parishes of Chard, Winsham, Chillington, Dinnington, Shepton Beauchamp, Seavington St. Mary, Seavington St. Michael, Kingstone, Dowlish Wake, Knowle St. Giles, Chaffcombe, Cudworth and Cricket St. Thomas.

Petty Sessional Division of Crewkerne: The parishes of Wayford, West Crewkerne, Crewkerne, Misterton, North Perrott, Merriott, Hinton St. George and Lopen.

Temporary provision in regard to the straying of animals on Dartmoor

(1) The provisions contained in Article 8 of the Foot-and-Mouth Disease (Infected Areas Restrictions) Order of 1938, prohibiting the straying of animals upon any road or other highway in an Infected Area, shall not apply to any road or highway passing over the part of Dartmoor situate

within the Infected Area declared by this Order, hereinafter referred to as the "said Moor," nor to animals grazing on the said Moor.

(2) No cattle, sheep, goats, or swine shall be moved on to the said Moor from any place not being situate on the said Moor.

(3) Cattle, sheep, goats, or swine being moved with a licence under the Foot-and-Mouth Disease (Infected Areas Restrictions) Order of 1938 shall not be moved along or across any road or highway passing over the said Moor except by lorry or other vehicle.

(4) The unloading of any cattle, sheep, goats, or swine from any lorry or other vehicle on the said Moor or on any road or Highway passing over the said Moor is prohibited.

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Feeding of Poultry

Sir,—I have read, with much interest, Mr. E. G. Harry's excellent paper, "The Effect on Embryonic and Chick Mortality of Yolk Contamination with Bacteria from the Hen" (*Vet. Rec.* **69**, 1,433), the more so, because the organisms he encountered bear a striking similarity to those encountered by me during investigations into six-day disease (Barton Mann, 1945).

However, I would question his assertion in paragraph 7 of his summary, "Factors contributing to fatal yolk infections are a low standard of hygiene on the supply farm and hatchery," if, by this statement, he means external hygiene.

I have yet to learn, after more than 30 years, how attention to hygiene *via* cleanliness, disinfectants, and all the other paraphernalia associated with a "good clean-up" can possibly eliminate infection from farm premises, if the infection is a man-made one engendered in the stock by wrongful feeding practice. This implies that every animal in the herd is maintained as a first-class culture medium for the bacteria listed —and many more. In this connexion, it would be desirable if authors, dealing with organisms suspected of causing mortality, would give some indication of the diet fed to the hens which produced the eggs and possibly some figures of the results of analyses of egg yolk and egg white for vitamin A, carotene, xanthophyll, and riboflavin. Such data would be a mine of information to those readers who wish to take a broader view of disease rather than the narrower one of the bacteriologist working at the *post-mortem* table.

It would seem to me that the day has gone when the veterinarian can turn to microbes for a scapegoat. One realises that infection, "intercurrent" or otherwise, is a very convenient way of "explaining" mortality. Is not a slavish adherence to microbic disease diagnosis, with its possible remedial hygiene and drugging, an admission of defeat? If one considers why escherichiae, aerobacters, proteus, salmonellae, bacilli (welchii types), micrococci, streptococci (Lancefield Group "D" types), and so on, *ad infinitum*, get into positions where they cause trouble in stock, it can only be supposed that they find the culture medium very much to their liking! There is no question that Mr. Harry is right in implicating faecal contamination.

I have found that in practical farming one cannot afford to rely only on hygiene. It has become necessary to find other methods of microbic control; the most promising appears to be dietary control as the following figures show. These relate to mortality on the 4 farms of this organisation and cover the years 1952-7 inclusive. The total number of turkey chicks involved is 734,094, widely spread under different managements with attendant differences in labour. The figures relate to chicks retained for rearing, an additional 1,200,625 having been sold during the period under review—apart from many thousands of growing poults 8 weeks old.

De Gruchy (1956) found a mortality figure of 16.3 per cent. from birth to slaughter in a turkey flock of 3,081 live poults received. Dyfri Jones (1957) returns mortality figures of 26.1, 16.8, and 11.0 per cent. for respective flocks of 50 to 200, 201 to 600, and over 600 in 1955. In 1956 he returns 24.0, 11.1, and 12.2 per cent. for similar flocks. The survey covered 18 farms in both years. Both authors find the majority of losses occur during the first month. It will be seen that the mortality figures on our 4 farms for 1952 and 1953 show close comparison with those of De Gruchy and Dyfri Jones.

One significant fact emerges with respect to our losses in 1952 and 1953. These are years during which we were dependent on proprietary foods during the brooding period. From 1954 we made our own foods. In 1956, increased production and a new farm (Sherborne) overwhelmed our mill capacity and we purchased 282 tons of proprietary rearing foods. This was distributed mainly between Wallop and Harewood Farms. Mortality directly increased on both farms, 2.6 and 1.0 per cent. respectively, but what was more disturbing, morbidity also increased, certainly not less than 10.0 per cent. in these proprietary-food-reared poults.

During 1957 we purchased no proprietary foods and our infantile losses declined to 2.56 per cent. (In the matter of hygiene it is to be noted that human infantile mortality in Great Britain is near 30 per 1,000 live births.) This 2.56 per cent. is near the irreducible minimum because it includes "help-outs," late-hatched, and deformed poults—the residues of incubation. "Regular" poult losses are less than 1.0 per cent.

It can categorically be stated that external hygiene has nothing to do with the matter at all. For, in 1952 and 1953, when mortality was at its peak, incubation was done in separate 100-egg sized machines, the poults were transferred to 60-size separate brooders and thereafter to separate verandas. All this with a view to rearing in small units in an endeavour to combat disease losses by isolation and hygiene.

Since 1954, we have introduced mammoth incubators, battery houses, poleyards, deep-litter houses, and compounds, *i.e.* mass rearing, where real external hygiene is impossible of practice. In addition, our main breeding flocks have been folded on "contaminated" pasture as opposed to the old practice of maintaining stock in verandas with wire or slatted

SUMMARY OF LOSSES 1952-1957

	1952	1953	1954	1955	1956	1957
Poults hatched	260,565	211,063	333,368	365,000	428,444	336,279
Poults to brooders						
Wallop farm	41,391	39,754	46,000	37,014	38,327	36,903
Harewood farm	41,032	41,469	44,262	40,500	40,271	36,332
Stockbridge farm	30,820	32,993	26,183	28,497	23,951	21,778
Sherborne farm				23,662	36,333	26,622
Total	113,243	114,216	116,445	129,673	138,882	121,635
Deaths in brooders						
Wallop farm	4,109	5,522	3,270	2,043	3,100	1,394
Harewood farm	13,179	7,791	3,396	2,115	2,491	841
Stockbridge farm	1,449	3,909	2,258	978	697	476
Sherborne farm				737	895	390
Total	18,737	17,222	8,924	5,873	7,183	3,101
Per cent. loss in brooders						
Wallop farm	9.9	13.9	7.1	5.5	8.1	3.78
Harewood farm	32.1	18.8	7.7	5.2	6.2	2.32
Stockbridge farm	4.7	11.8	8.6	3.4	2.9	2.19
Sherborne farm				3.1	2.5	1.46
Total	16.6	15.1	7.7	4.5	5.2	2.56

floors to prevent access to droppings by the birds. For example, Stockbridge Farm, of only 28 acres, has had poultry continuously for 26 years.

It does not require any great perspicacity to see that the trend of reduced mortality is common to all farms, all under different direct management. Further, from 1955 to 1957 inclusive, we have sold 739,533 day-old poults and neither from this laboratory nor from any other has a report gone out of disease traceable to our stock. We have not spent a penny on nitrofurans, sulphonamides, arsenicals, nor any of the anti-paratyphoids, coccidiostats, or blackhead remedies this year. Incidentally, we met and successfully dealt with fowl typhoid on all four farms in 1955. This disease originated in stock we obtained from an accredited farm.

The whole of this reduction in mortality has taken place because of attention to diet following the dictum that *one cannot feed the animal without feeding the microbes of the gut*. When more thought is given to the impact of nutrition on microbial diseases, and when potential pathogens cease to be elevated to virulence by faulty dietetics, then, it is conceivable we may hear less of that overworked and futile word "hygiene."

I regret the length of this letter but, Sir, no doubt, you will appreciate that as stock producers we must protest at a facile assumption that, *per se*, bacterial troubles in eggs and chicks arise from want of attention to external hygiene. Our experience with vast numbers of poults demonstrates clearly that proprietary foods and faulty diets must take their share of the blame.

Yours faithfully,
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December 23rd, 1957.

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We regret that several interesting letters have been unavoidably held over due to pressure on our space. They will be published next week.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th December, 1957	8	—	30	62	—	36
Corresponding period in 1956	12	—	9	113	—	18
Corresponding period in 1955	26	1	—	145	—	41
Corresponding period in 1954	22	—	—	40	—	51
1st January to 15th December, 1957	307	8	165	959	. .	921
Corresponding period in 1956	1,230	11	155	884	—	718
Corresponding period in 1955	747	7	7	769	—	1,372
Corresponding period in 1954	325	4	12	757	—	1,387